The Ford Rouge Explosion

Inter Office

Health Protection Services

September 2, 1999

To: Plant Managers
Plant Human Resources Managers
Plant Safety Engineers

cc: Division/Operation Managers
Division/Operation HR Business Operations Managers
Division/Operation and Chief Safety Engineers
Health Protection Services Managers
Human Resources Directors
D. L. Murphy
Persons Designated by the Above.

Subject: Final Report of the Employee Fatalities at the Rouge Powerhouse

This afternoon, the Company and the UAW will release their joint report on the February 1, 1999, explosion and fire at the Rouge Powerhouse that resulted in an unprecedented loss felt by the entire Ford Motor Company community. One employee died at the scene and nineteen employees were hospitalized. Subsequently, five employees died in the hospital.

The Company releases this report with great sorrow and sympathy for the families involved. The employees who died are:

Employee	Classification	Date of Death
Don Harper	Pipefitter	2/1/99
Cody Boatwright	Welder	2/5/99
Warren Blow	PSO Leader	2/12/99
Ken Anderson	Pipefitter	2/14/99
John Arseneau	Pipefitter	2/20/99
Ron Moritz	Maintenance Supervisor	2/20/99

This comprehensive investigation report reflects a commitment to Ford employees to search for answers and to use that information to improve our workplaces. The recommendations include required actions for Company-wide application.

Your leadership is essential to protecting the health and safety of employees. Thank you for your support and commitment.

Doris J. Morgan, Manager
Occupational Safety

Attachment

UAW-Ford Joint Investigation Report

Rouge Powerhouse Explosion

February 1, 1999

Summary

On February 1, 1999, at approximately 1:00 PM, an explosion and fire occurred at the Rouge Powerhouse. One employee died at the scene and nineteen employees were hospitalized. Subsequently, five of the nineteen hospitalized employees died in the hospital. The employees who died are; Don Harper, pipefitter, Cody Boatwright, welder, Warren Blow, PSO Leader, Ken Anderson, pipefitter, John Arseneau, pipefitter and Ron Moritz, maintenance supervisor. An investigation was started on the day of the incident to determine how and why the explosion and fire happened so that a similar incident can be avoided in the future. The investigation involved approximately 160 employee interviews, 30,000 photographs, 75 hours of videotape, and 500,000 pages of documentation.

At the time of the incident, Boiler No. 6 in the Rouge Powerhouse was being shut down and prepared for a planned annual inspection and overhaul. The shut down process began on Friday, January 29, 1999 and continued on Monday, February 1, 1999. By approximately 10:00 AM on February 1, all fuel sources for Boiler No. 6 (i.e., blast furnace gas, pulverized coal, and natural gas) had been shut off and the flame extinguished as final arrangements were being made to secure the boiler in order to begin the work that had been planned.

As part of the shut down process, the natural gas manual valves on the second floor of the Powerhouse for the main gas lines (i.e., east and west main risers) should be closed. In addition, blanks should be inserted into both the east and west main risers. During the investigation, the natural gas manual valve on the second floor for the west gas main was found in the closed position. The natural gas manual valve for the east gas main, however, was found in the open position. The job of blanking the west gas main was underway at the time of the explosion. The blank had been inserted in the line, but the bolts had not all been tightened on the flange. The east gas main had not yet been blanked.

There are six natural gas burners on Boiler No. 6, three fed from the west gas main and three fed from the east gas main. Each natural gas burner is equipped with a pneumatic flow control valve that is operated from the control room for Boiler No. 6. During the shut down process, all of the pneumatic control valves as well as 24 manual pilot and ignitor valves are closed in order to extinguish the flame in the furnace of the boiler. Later in the process, the pneumatic valves must be opened, at least partially, in order to purge any residual natural gas trapped between the gas mains on the second floor of the Powerhouse and the burners. Tests performed during the investigation established that, at the time of the incident, the pneumatic control valves for both the east and west burners were partially open.

There are two other pneumatic valves in the main natural gas lines, one on the east main riser and one on the west main riser. These pneumatic valves had been

associated with a flame detection system designed to monitor pilot, ignitor, and burner flame. The system was designed to prevent fuel flow if a flame was not present. The system had been taken out of service more than thirty years ago because of an inability to correct periodic fuel shutdowns even when a flame was present. Efforts to correct the problem were unsuccessful and a decision was made to disable the flame supervision system by maintaining the natural gas valves in the open position when a flame was not present. The system was subsequently dismantled.

Based on natural gas recording charts, which were recovered during the investigation, natural gas usage in the Powerhouse remained relatively constant from 10:00 AM, when the flame was extinguished in Boiler No. 6, until just before the incident. At approximately 1:00 PM the natural gas recording charts show a sudden increase in natural gas usage when the pneumatic burner control valves for the east burners were opened from the control room for Boiler No. 6. The gas associated with this increased flow entered Boiler No. 6 through the east main gas riser. Although the gas flow into Boiler No. 6 lasted only about one to two minutes before the explosion, the gas flow was sufficient to create an explosive gas/air mixture in Boiler No. 6. When this gas/air mixture contacted an ignition source, the explosion occurred. The source of ignition is unknown and cannot be precisely determined. Some possible sources of ignition were an electrical arc in the precipitator or hot ash/embers collected at the precipitator, which would normally be present during operations.

Investigation Findings

1. Boiler No. 6 was issued a license to operate each year, including 1999, based on state authorized and required inspection reports.
2. Flame detection/supervision controls had been defeated in 1966 and had never been replaced or updated. Four consultant reports, issued from 1987 to 1998 recommended that flame supervision and combustion controls be restored or installed on all of the boilers in the Powerhouse, including Boiler No. 6. Insurance carrier reports issued each year from 1990 to 1998 repeated these recommendations. These reports were not the basis for licensing.
3. There was not a written procedure for shutting down Boiler No. 6.
4. The procedures, sequence and responsibility of tasks to shutdown boilers varied between shifts and personnel.
5. The common method for shutting down boilers was to extinguish pilots and ignitors prior to purging gas from natural gas main lines.
6. A pre-job planning meeting involving all participants was not conducted to assign and review responsibilities for the shutdown of Boiler No. 6.
7. Several safety devices such as pressure relief valves, electric spark ignitors, low water alarms, interlocks to shut off gas flow if fans are not operating, and related audible and visual alarms had been defeated or removed.
8. The preventive maintenance program was not completely effective in that it did not include inspection and testing of all critical loss control items, such as gas main valves and safety devices.

9. A department safety lockout procedure was not used to prevent re-energizing equipment down for maintenance.
10. There were a significant number of leaks from coal handling equipment that resulted in coal dust accumulations on equipment and overhead structures. The cleaning program did not adequately address coal dust accumulation.

Recommendations

The recommendations 1 through 5 apply to boilers and combustion fired equipment. The principles embodied in the recommendations such as compliance with codes and standards, use and maintenance of safety devices, proper use of procedures, preventive maintenance for safety items and recommendation 6 on emergency response apply on a Company-wide basis.

1. All facilities will identify and comply with applicable codes and standards related to all stationary combustion fired equipment. The Company will help facilities achieve this by providing technical expertise to train employees and/or conduct inspections of combustion fired equipment over 400,000 Btu's per hour.

2. All facilities shall evaluate the control systems of combustion fired equipment to ensure that combustion controls, including flame detection/supervision systems, are in place and operational. Flame supervision and combustion control systems may include, but are not limited to, the following:
   - Flame detectors
   - Thermocouples
   - Associated valves
   - Relays
   - Sensors
   - Timers
   - Controllers
   - Circuits

   Combustion fired equipment may include, but is not limited to, the following:
   - Boilers
   - Water heaters
   - Heat treat furnaces and ovens
   - Gas generators
   - Curing furnaces and ovens
   - Air make up units and heaters

3. Safety procedures will be current and maintained. Special emphasis will be placed on the development of:
   a) Detailed step-by-step written procedures and checklists for critical tasks, including start up and shut down, service of fuel systems and work near high voltage. The written procedures and checklists shall be reviewed with all affected personnel to ensure the procedures are understood and followed.
   b) Defined responsibilities for each specific task in the written procedure.

c) Procedures to secure fuel and energy sources during the shutdown process and prior to service and maintenance.
   - Procedures are not a substitute for safety devices and systems.
   - Procedures must supplement flame supervision and other safety devices.
   - Procedures must not include defeating safety devices or safety systems.

Supervisory personnel shall monitor start up and shut down procedures to ensure that specific tasks have been completed.

For those procedures performed on combustion fired equipment on an infrequent basis (e.g., less than once every six months), the procedures must be reviewed with employees prior to starting the specific tasks.

A change management process to ensure that safety devices, preventive maintenance practices, and written procedures are updated and accurately reflect safe work practices and any modifications to the equipment being operated. These changes must be communicated, understood and followed by all affected personnel.

4. Combustion controls must be periodically evaluated to ensure that equipment modifications or upgrades due to new technology are incorporated when necessary and appropriate to improve personnel and operational safety. In those instances where updated standards are not adopted, reasons must be documented by facility engineering and approved by the respective divisional or operations safety office.

5. All facilities shall have a preventive maintenance program to inspect and test the integrity of:
   - All combustion controls at the frequency established by the system manufacturer.
   - Main gas valves and emergency shut off valves.
   - All safety devices such as pressure relief valves, low water cut-outs and alarms and safety interlocks.

   These inspection and testing activities shall be documented, and deficiencies tracked until corrected.

   Maintenance procedures must be part of the change management process noted in recommendation number three. Changes to procedures that result from the change management process must be reviewed with affected employees.

6. All facilities shall re-evaluate the status of their emergency plan and emergency preparedness. Consideration of the following key areas is essential:

   a) Communications
      i. Verify that notification lists of key plant personnel, emergency services, governmental agencies, public utilities, contractors, and suppliers are up to date.
      ii. Designate a spokesperson and a staging location for interaction with the media.
      iii. Have a plan to alert employees about work schedules and when to return to work.

   b) Coordination of Emergency Response
      i. Review the incident command system plan for response to emergencies.
      ii. Conduct a mock disaster drill with participation of external agencies.

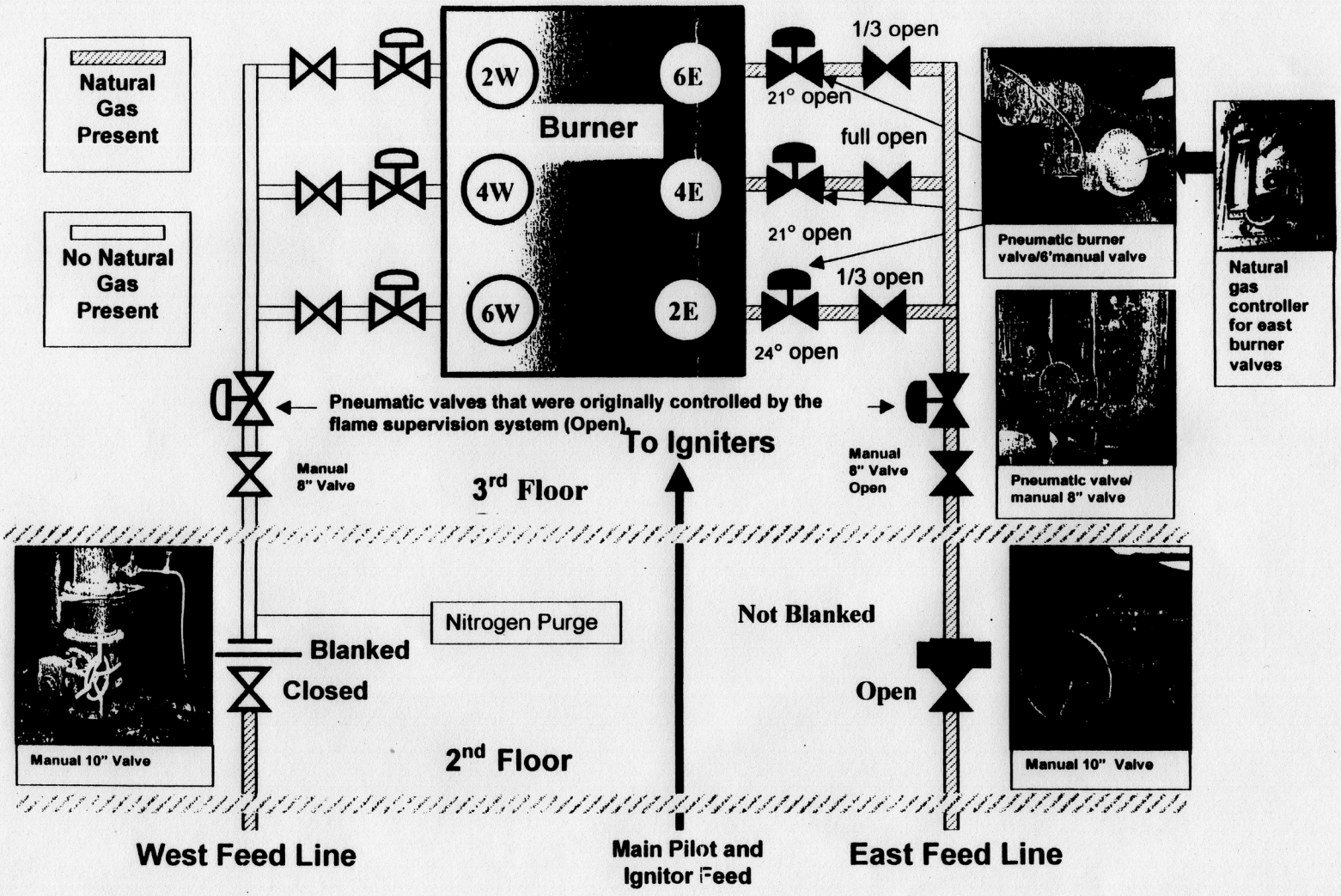
   c) Emergency Planning
      i. Verify that evacuation plans include assembly areas located at approximate distances (e.g., 500 feet) from the building. Verify that all supervision and employees understand the plan and know how to implement. Consider evacuation/assembly drills.
      ii. Verify that emergency lighting, emergency power, fire and evacuation alarms, fire suppression systems, fire pumps, and other emergency equipment are in place and functional.
      iii. Verify that a sufficient number of employees are trained in the incident command system from each operating shift to effectively manage an emergency situation.

This report shall be distributed to all affected persons so that a similar incident can be avoided in the future.

Natural Gas Piping System For Boiler No.6

Natural gas for the burners on Boiler No.6 is supplied by risers on the west and east side that carry gas up to the third floor. Two ten-inch manual valves are located on the second floor just below the blanking area. On the third floor there are two manual 8-inch valves. Just downstream from the manual valves are two pneumatic valves related to the flame supervision safety system rendered inoperative more than thirty years ago. Further downstream are manual and pneumatic valves for each of the six burners, three on the west side and three on the east side.

System Status At The Time Of The Explosion



Distributed September, 1999

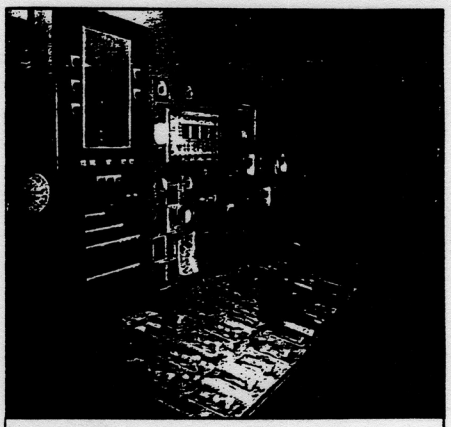
Sequence of Events

The following is based on employee interviews and comprehensive inspection and testing following the incident.

At the time of the explosion, Boiler No.6 was being shut down for a planned annual inspection and maintenance.

On Friday, January 29, 1999, initial steps were taken to shut down Boiler No.6. Three fuel sources can be used to heat water to produce steam in the boiler: blast furnace gas, pulverized coal and natural gas. One of the two blast furnace gas lines to Boiler No. 6 was shut off and blanked on January 29. Blanking involves the installation of the steel plate between two pipe flanges to positively prevent fuel entry to the boiler. This procedure protects personnel who may have to enter the boiler to perform inspection and/or maintenance. The day shift on Monday, February 1, 1999 began work at 7:00 A.M. At that time Boiler No.6 was operating normally with a load of about 350,000 pounds of steam per hour, using coal to empty the bunkers. The natural gas control was set to about 17%. There are three natural gas burners on both the east and west sides of the boiler. The pipefitters worked on blanking the remaining blast furnace gas line during the morning and completed blanking by 10:00 A.M.

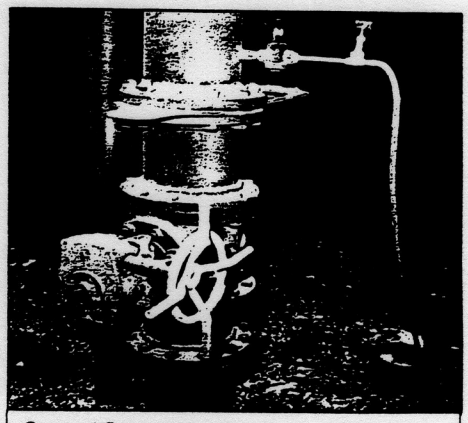
Between 9:30 A.M. and 10:00 A.M., two operations general supervisors entered the #6 control room to make the final arrangements to shut down the boiler. The coal feeders were shut off one at a time. At this point four power service leaders and one power service operator were present in control room #6. One operations general supervisor and one leader were at the controls. The general supervisor switched the water to manual. The natural gas burner valve controls were turned to "0%". The general supervisor asked two of the leaders to secure the natural gas. The leaders left the control room to close the ignitor and pilot valves, the main feed valves for the pilots and ignitors on the third floor and the natural gas manual valves. Upon returning to the control room one of the leaders told the general supervisor that the pilot and ignitors were shut off as well as the "10 inchers" implying that one of the natural gas manual valves was closed on the east and one on the west side. Inspection and x-ray of the third floor valves after the explosion shows that both valves were open. The manual west second floor natural gas valve was closed and the manual east second floor valve was found open.



Main control panel in control room 6.

According to the most common shutdown procedure reported by employees, both manual valves on the second floor should have been closed before blanking began. (Some leaders reported closing both the second and third floor manual valves.) The general supervisor told a leader to leave both sets of forced draft and induced draft fans on. The draft reading (static pressure) was reported to be a negative one-inch.

At about 12:20 P.M., four pipefitters were told to start the natural gas blanking process, after which they left the pipefitter shop with their supervisor. A welder was assigned to assist the blanking by preparing a nitrogen tank and hose to purge the gas lines. A hose from the nitrogen tank was lowered from the third floor to the second floor near the west natural gas main. The nitrogen line was attached to a 1/4-inch valve connected to the gas main. The bolts were removed from the flange, the steel blank was slid into place with the solid side of the blank in the gas line and the bolts were replaced. At the time of the explosion all of the bolts except one had been installed, although the bolts had not yet been tightened. Wrenches were still present at the scene after the explosion.



Second floor west natural gas valve with blank inserted.

The nitrogen purge performs two functions. First, it creates an inert atmosphere around the blanking area. This is necessary because the normal procedure was to use common steel wrenches, capable of producing sparks, to loosen and tighten the bolts. The second purpose of the nitrogen purge is to force gas trapped in the line between the second floor manual valve up through the riser to the third floor, out the burners, into the boiler, and then out to atmosphere. In order to do this, it is necessary to re-open the burner valves using the east and west side controllers in the control room. Tests revealed that the east side gas burner valves were open approximately 25% at the time of the explosion.

A couple of minutes before the explosion one of the general supervisors entered #6 control room appearing to be aware of a problem, and said words to the effect that "Someone left the valve open." The general supervisor may have turned a control. He then told one of the leaders to come with him, and they both quickly left the third floor control room for the second floor. Evidence indicates that both got to the second floor in the area of the east natural gas valve. The explosion occurred a short time after they left the control room.

This boiler is equipped with two forced draft fans that supply combustion air to burners and there are two induced draft fans that pull combustion product out of the boiler. Tests conducted during the investigation reveal that the south forced draft fan was on and the north forced draft fan was off. Each forced draft fan is equipped with two inlet dampers. A mechanical linkage coordinates the motion of the dampers. The inlet damper radial vanes on the south fan were open about 5 degrees. The damper vanes on the north forced draft fan were closed. Tests also reveal that the south induced draft fan was on and north induced draft fan off. It is not possible to determine the position of the induced draft fan dampers through inspection because damper position is set by electronic controls designed to vary damper position to maintain a set draft (static pressure).

A torque test was performed on the east manual gas valve to determine the amount of force needed to close the valve. The initial force required to begin closing the valve was between 230-240 foot-pounds. For purposes of comparison, the force required to close the second floor west gas valve was approximately 50-60 foot-pounds. The valve wheel is 24 inches in diameter and located 23 inches above the floor. The valve is closed by turning the handle (wheel) clockwise. Human factors studies indicate that very few individuals would be able to exert such force while attempting to close the valve in the two most likely positions: standing in front of the valve with both hands on the handle or attempting to pull upward on the wheel from one side.

Torque testing of east second floor valve.

Analysis and Contributing Factors

Natural gas usage recording charts were recovered from the Powerhouse and analyzed. The charts showed that there was an abrupt increase in gas flow one to two minutes prior to the explosion, followed by a decrease. The potential volume of gas and air that could have occupied the boiler furnace and flue gas ducting has been calculated. Based on the calculations, sufficient natural gas and air entered the furnace of Boiler No.6 to produce an explosive concentration. Pulverized coal and other combustible materials such as the engine room asphalt roof and lubrication oil contributed to the subsequent fires, which burned for a long period of time.

There were five locations on each side of the boiler at which valves had to be open to permit natural gas to enter the boiler furnace through the burners.

1. A ten inch main manual gas valve on the east riser, second floor
2. An eight inch main manual gas valve on the east riser, third floor
3. An eight inch pneumatic valve on the east riser, third floor (remnant from the flame supervision system)
4. Three pneumatic regulating valves on the east side of #6 boiler, third floor
5. Three manual valves on each burner

(See system piping schematic on page 7)

To purge the east gas main riser from the blank to the burners, all of the downstream valves would have to be open, but it was essential that the second floor ten inch main on the east riser be closed. The explosion could have been prevented if valve(s) at any one of the five locations on the east gas train had been closed prior to the explosion. The main gas valves on the second floor are manually operated and should be closed and the line blanked as part of the procedure to shut down the Boiler No.6 natural gas fuel source. The leaders and supervision participating in the shutdown of Boiler No.6 were experienced, but Boiler No.6 was infrequently shut down and secured. The procedures reported for securing the natural gas to Boiler No.6 and the other boilers were not uniform. Most of the boiler operator leaders reported that they would close both the east and west natural gas mains on the second floor at the same time. Both of the main manual valves on the east riser were open at the time of the explosion. There was an apparent lack of communication or miscommunication during the shutdown procedure regarding the status of these valves.

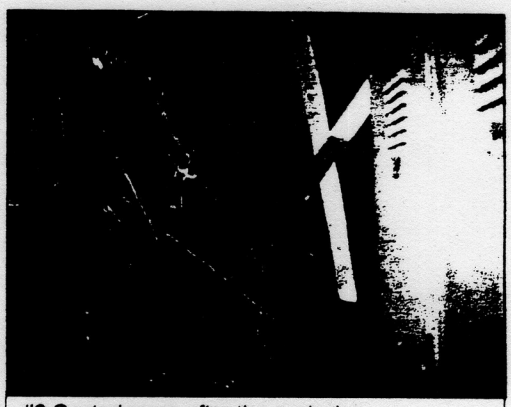
The pneumatic regulating burner valves are controlled remotely from the control room of No. 6 Boiler. These valves regulate the amount of natural gas entering Boiler No.6 through the burners during normal operation of the boiler. When the boiler is shut down, these valves would be closed by manipulating the pneumatic controls in the control room of No. 6 Boiler. The closing of these valves along with the pilot and ignitor manual valves on February 1, 1999 was verified by visually observing that flame had been extinguished in the Boiler No. 6 furnace. During the process used to secure the boiler for entry by workers, a blank is installed in the natural gas mains immediately

downstream of the main gas valves on the west and east risers on the second floor of the Powerhouse. Nitrogen is introduced into the natural gas mains adjacent to the flange where the blank is located. As part of this process, the pneumatic control burner valves are re-opened from the control room of No. 6 Boiler, to allow any trapped natural gas and nitrogen to escape from the second and third floor gas mains through the main burners into the furnace and eventually to the atmosphere. The controllers for the pneumatic control valves for the east and west burners were found in the open position following the explosion. The east and west burner valves were opened to proceed with the process of blanking the natural gas mains, not knowing or realizing that the main gas valve on the second floor east riser had not been closed. A safer procedure would have been to use the industry practice "double block and bleed" method, which is recommended by national consensus standards. This method involves closing and locking out two adjacent valves in a fuel line and then venting the trapped gas to atmosphere. Implementation of this procedure on Boiler No. 6 would have included shutting off and securing the gas mains on the second and third floors and venting the trapped gas. Using this procedure would have required the installation of a vent pipe for each gas main to atmosphere.

The fireye (flame supervision) combustion control system was part of the original installation and operation of the boiler in 1966. The system performed its safety function shutting off fuel supplies when a pilot, ignitor or burner flame was not detected. However, the system caused repeated disruptions to boiler operations by shutting off fuel when a flame was present. This situation occurred most frequently when blast furnace gas was being used. Blast furnace gas can vary significantly in pressure and chemical content. Efforts to correct the problem were unsuccessful and the system was defeated by wrapping wire around a pneumatic valve, causing a constant flow of air to the actuator, which maintained the east, and west third floor valves in the open position. The system was subsequently dismantled except for the pneumatic natural gas valves on the third floor. If the system were functioning the flame supervision system would verify operational characteristics, such as the presence of a flame, and shut off the gas to the burners if flame is not present. Under these circumstances and utilizing the "double block and bleed" procedure above, a functioning flame supervision system could have prevented this incident.

Investigation

After the explosion personnel shut down Boilers 3, 5, and 7. In addition gas mains were shut off, as well as all electricity to the Powerhouse. There is no evidence that Boiler No. 6 controls were changed or valves turned after the explosion. The explosion caused major damage to the control room for Boilers 2 and 4 and it is unlikely that the controls were changed.



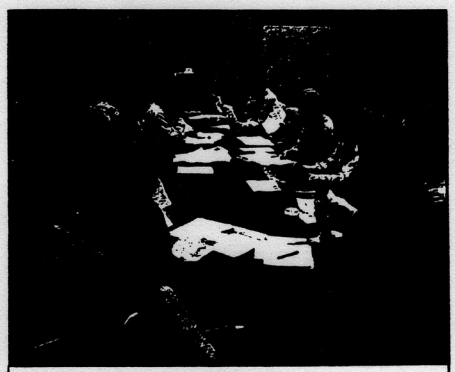
#6 Control room after the explosion.

Securing the Site

Shortly after all of the personnel from the Powerhouse were accounted for and the fires were extinguished the building was secured. A fence was constructed around the entire Powerhouse and entry was controlled. Every entry into the Powerhouse requires a completed form outlining who will enter, what areas will be visited, and the purpose of the entry. Entry forms must be signed by the Dearborn Fire Marshal, the Incident Commander, a Safety Officer, a representative of the Fact Finding Committee (Ford-Rouge Steel) and the senior investigators from the Fact Finding Committee. All site activity, including removal of documents and evidence and testing of equipment, is under the authority of the Dearborn Fire Marshal, pursuant to a court order regarding preservation of evidence.

Joint Investigation

Due to the magnitude of the incident and the fact that the Powerhouse is jointly owned by Ford Motor Company and Rouge Steel Company, there are multiple parties involved in the investigation. From the start, the Company and UAW conducted a joint investigation as was done in the past. Additionally, experts were retained to assist the Company in this investigation. The UAW's investigation was coordinated between the UAW Health and Safety Department, the UAW National Ford Department and UAW Local 600. In addition, MIOSHA compliance officers have made several entries into the Powerhouse and participated in most interviews and have received technical assistance from a State of Michigan boiler inspector. Finally, numerous insurance companies have an interest in this investigation. The investigation is unique in that parties with an interest in the incident including Ford, Rouge Steel, the UAW and the insurance companies have signed a Memorandum of Understanding (MOU).



Fact finding committee meeting.

The MOU provides for:

1. The formation of a Fact Finding Committee which meets weekly to coordinate the investigation.
2. Committee membership consists of a representative from the UAW, several insurance companies, and the Dearborn Fire Marshal. Representatives of co-owners Ford Motor Company and Rouge Steel jointly chair the committee. Additionally, a group of experts was formed as a resource to the Fact Finding Committee, and consisted of representatives or nationally renowned boiler fire and explosion firms.
3. Implementation of a single forensic photography process to document physical conditions and map physical evidence. The committee chair approves handling and removal of evidence.
4. No party to the memorandum shall disassemble, alter, damage or destroy any physical evidence on the site except in compliance with protocols developed by the committee.
5. Any physical evidence that a committee member requests to be retained, in consultation with the Dearborn Fire Marshal and other government agencies, shall be retained at a secure evidence storage area.
6. All parties to the agreement shall have access to all photographs, films and videotapes of the site as well as to all relevant documents, provided that such documents do not contain confidential business information.
7. The parties will use the evidence preservation guidelines of NFPA 921 (National Fire Protection Association, Guide for Fire and Explosion Investigations).

As referenced above, all site activity was under the jurisdiction of the Dearborn Fire Marshal. In addition to the provisions of the MOU, the Dearborn Fire Marshal required all facts, photographs, and results of tests conducted onsite to be made part of the common evidence pool.

Interviews

Approximately 160 interviews have been conducted. Early in the investigation, the UAW and Ford agreed to conduct joint interviews and invite MIOSHA to attend. The purpose of this approach was to reduce the number of interviews each employee would have to attend to minimize the stress and emotional impact. Each hourly employee met with a counselor prior to the first interview. Many of the victims could not be interviewed for weeks or months after the incident because of hospitalization and recovery.

Investigators preparing to enter the Powerhouse.

Physical Evidence

The investigation of physical evidence on site has been very difficult. The building was built in 1919 and contains a great deal of asbestos, primarily used for insulation, which has been disturbed. Except for a couple of temporary extension cords to supply lights on stairways, there is no power in the building. Most areas are dark. Each person entering the facility must be clothed with disposable coveralls, latex gloves, hard hat, respirator, boots, safety harness and safety glasses. One member of each entry team must wear an air sampling pump to collect air samples, which are analyzed to determine the level of airborne asbestos. Another member of each entry team wears an explosive gas detector. Teams are in constant radio communication with the incident command center outside the building.

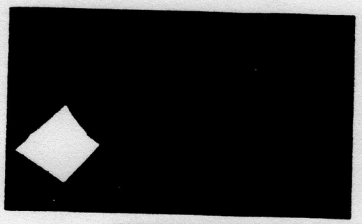
Investigators checking the west second floor natural gas valve and piping systems.

Over 30,000 photographs have been taken. All photographs taken inside the Powerhouse are logged and placed in the common evidence pool. In addition to the photographs over 75 hours of videotape have been shot during the investigation.

Over 500,000 pages of documentation have been collected or recovered from the Powerhouse. All original documents removed from the Powerhouse are stored, after appropriate decontamination measures are taken, in a secure facility. Relevant documents are copied and stored in the evidence library at the Rouge Office Building.

Physical Evidence Recovery, Documentation and Security

Items to be recovered are identified.

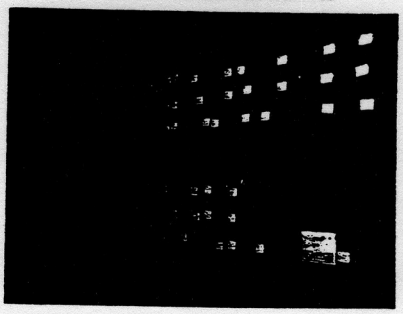


A grid is created referencing a building column and the position of the object is measured and located on the grid.

The object is then photographed. Orientation shots are taken and then a close-up. An evidence tag is created and the object is photographed with the evidence tag and then bagged.

Evidence information is entered into a computer database.

Physical evidence and documents are then stored in a secure locked warehouse.



UAW-Ford Joint Investigation Team

The following individuals were directly involved and contributed to this joint investigation and/or assisted in the development or review of this report.

Greg Anderson	Manager, Health and Safety Programs, Union Affairs
Peter Dooley	International Representative, UAW Health and Safety Department
Floyd Ford	International Representative, UAW National Ford Department
John Gutzman	UAW Health and Safety Representative, UAW Local 600
Hap Harrison	UAW Health and Safety Representative, UAW Local 600
Jim Howe	Assistant Director, UAW Health and Safety Department
Mickey Long	International Representative, UAW National Ford Department
Frank Mirer	Director, UAW Health and Safety Department
Doris Morgan	Manager, Corporate Safety
Mike Nadeau	Corporate Safety Engineer
James Patton	Coordinator, UAW National Ford Department
Joe Peters	Assistant Director, UAW National Ford Department
Chris Petersen	Corporate Safety Engineer
Dave Saksewski	International Representative, UAW Health and Safety Department
Randy Smitt	Corporate Safety Engineer
Tim Watt	Division Safety Engineer, Ford Customer Service Division

Primary report preparers italicized and bolded.